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ABSTRACT

Jean Piaget's research has indicated that people must do activities or operations in order to retain and order things in their minds. This document presents activities for the sensorimotor, preoperation, and concrete operation stages. The activities are designed for specific operations and can be carried out in classrooms or other appropriate settings. (JRH)

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Piagetian Operational Activities: Sensorimotor through Concrete Operations.

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Jean Piaget's (1952) research indicated to him (and to many that have studied Piaget and related situations) that we *must do activities* or operations so that we may retain and order things in our minds. The following are suggested activities for the sensorimotor, preoperation and concrete operation stages. These activities are designed for specific operations (see Phillips & Phillips , 1988) and can be carried out in classrooms or other appropriate settings.

SENSORIMOTOR ACTIVITIES

1. Bubbles: (tertiary circular reactions)

Materials: Bubble solution (either purchased or made from Joy detergent, glycerin, and water), straws, wire rings, plastic rings, plastic ring sizers, paper cups, plastic recorders, etc.

Soap solution is available in bowls and cups with various combinations of objects close to the solution, as child works with solution, teacher can also sit down and blow bubbles. Various questions can be asked as the child blows bubbles: How big a bubble can you make?; How long does the bubble last? Can you keep the bubble from falling on the table? Do you see any colors in my bubbles? Do bubbles make any sounds? Any colors in yours? Can you tell where bubbles have landed? etc.

Criteria for selection: Use of materials that will involve coordination of muscles and use of senses. This was chosen also to develop interest in novelty, desire to reproduce an interesting event, discovery of new means, imitation of seeing others produce various bubbles with different objects and do different things with bubbles and to start learning by inventing new ways.

2. Leaves

This activity is one for an older child, a toddler rather than an infant. As you are walking with this child, you start collecting various leaves (grass blade, maple leaf, burr dock leaf, variegated dogwood leaf, etc. chosen for their variety of shape, color, texture, size). As each leaf is picked and added to the collection (the collection is held and carried by the child), you can sit down and talk about the leaf, feel it, smell it, compare size,

shape etc. but always the child handles, moves, tears, etc. all the leaves. The collection need not be large, just varied.

The purpose is to let the child explore not only the various characteristics of the leaves, but practice using their senses in new ways.

PREOPERATIONAL

1. Role playing.... Preferably done outside

Children (about age four to seven) are in groups of two to three. Each child in the group is to select something, a tree, bird, rock, mountain, dandelion parachute seed, etc. (teacher may need to do role playing first to help with the imagination). Pretend you are that object, coordinate your body, feelings, and activities to experience that object. Others in the group can add to the role playing, such as being wind, rain, etc. and the player interact with that aspect. Older children can ask various questions of the "object" such as of a baby tooth: Why are you loose? How do you feel when a string is put around you...? Or Why are you (moss) on tree bark, etc.

The purpose is to develop symbolic play, mental symbols, develop imagination in a coordinated way, practice with language and practice interactions with others in a cooperative situation.

2. Collections

Materials can be a variety of groups of leaves, barks, types of cloth materials, buttons, etc.

Have child sort the material into various groups and explain to you what the names of the groups are. Then regroup them and go through the same process. If they run out of ideas as to regrouping, have them work with another group.

Purpose is to help build structures towards classification.

3. Relations

Materials: Various levels of LEGO sets.

Have the child explore the relations (Ordering, coordination, correspondence, etc.) of the various parts in the set. The first sets of LEGO have fewer different types of elements in each set, yet many numbers of the same elements so the child can discover that this element can attach to the same element in n ways, but only this way to this other element, etc.

Purpose is to have the child build the structures of relations.

CONCRETE ACTIVITIES

1. Seed Activity

Materials: 3 - 6 inch planting pots, with drip tray
potting soil
radish seeds (may also use bean or pea seeds)

Purpose: This activity is to promote the student's understanding of

variables that are involved in the activity
cause/effect relationships,
reversibility (can mentally retrace actions),
reevaluate actions that have been performed and the consequences of those actions.
controlling variables
the degree of variability of each variable
evaluate rank order of variables at each stage

A. Have students plant seeds according to directions on the seed package. Remind the students that this project is now their project and their responsibility but THEY may ask questions of you from time to time. Give no other directions than this.

B. Germination time under ideal conditions are approximately 7 days for

radishes and 10-14 days for beans and peas depending on variety and type. You may wish to keep a record for your own purposes of what each student is or is not doing to and with their seeds. [For instance, one student may have decided that the seeds need bottom heat to germinate and places the pots on the top of the aquarium to get heat from the lamp (but you know that this temperature is generally greater than 80 degrees F. because of the metal conductivity). Another student may decide that seeds need sunlight to germinate and puts the pots next to a cold drafty windy with marble window sills.] Again, this information is only for you. At about mid germination time - about ten days after initial planting - ask the student(s) how their plants are doing.

C. You can take your cue from the student's responses...if the seeds have germinated and sprouted, continue as before. You can ask the student WHAT they are doing and WHY from time to time. Remember to not lead, direct, praise. Repeating the student's response is a neutral response and then you can ask questions of student's activities and reasons. [The student may have had successful germination and sprouting but then decides that the plant needs to stay on top of the aquarium; or may move to a corner of the room where there is not enough light; or may water too much or too little; or decides to fertilize the plant to "make it grow faster".] Again, use questioning techniques to help the students discover the effect by themselves.

D. If the student asks you directly as to the reason for an effect, there are several tactics you may take. Depending on the situation and the student, you may redirect the question back to the student such as "What do YOU think could be the reason? ... Why?" If this does not seem to be productive, the questions could be more convergent such as "Have you seen your seed since you planted it? ... Could this possibly tell you why it didn't come up? Let's see."

E. Your notes will help you in asking the right questions with the appropriate student as the project continues. If some students planted radishes and some beans and the bean plants have blossoms but the radishes do not have blossoms, how would handle this? Write some possible responses.

2. Tiles

Materials: Multiple sets of tiles from either tanagram sets or tessellation sets, can be wood, plastic, or ceramic, and mirrors.

Procedure: The child will work with the various pieces to make their own designs. Questions may be asked during this process as to what they are doing and why they are doing what they are doing. Other questions such as "What else can you do with these" or "Can you make the design that is in the mirror and have the design that is now on the table be the one that is in the mirror?"

Rank ordered criteria: Activity selected to develop understanding and provide experience toward:

Equivalence (i.e., two right triangles can "take up the same space and this rectangle");
Correspondence (This side of a parallelogram "goes with this side of a pentagon)
Properties of simple Euclidean geometry
Relations of objects in two dimensions
Symmetry
Asymmetry
Reversibility (mirror images)
Beginning of combinatorial logic

3. Geo blocks

Materials: Wooden or plastic blocks of different but corresponding shapes so that at least one face of each shape corresponds to another face or side. Mirror.

Procedure: The same as Activity #2, Tiles. Because these are three dimensional objects, the mirror should always be placed directly opposite the front of the student and the design. This can be modified much later.

Rank ordered criteria: Activity selected to develop understanding and provide experience toward:

Equivalence (i.e., two right triangles can "take up the same space and this rectangle");

Correspondence (This side of a parallelogram "goes with this side of a pentagon)
Properties of simple Euclidean geometry
Relations of objects in three dimensions
Relations between "open" and "closed" volumes
Symmetry
Asymmetry
Reversibility (mirror images)
Beginning of combinatorial logic

4. Perception

Materials: Same as Geo blocks plus paper and pencil and eraser.

Procedure 1: The student will put only two to three (at first) blocks together in a design of their own. Then the student will draw what s/he sees on paper from ONE perspective position (translating three dimensions to two dimensions using perspective, shading, etc.).

Procedure 2: The student will put a design together as before but attempt to draw this from four (90 degree) perspectives.

Procedure 3: The student will remember various block pieces and DRAW them in some order on paper, then try to replicate this in three dimensions.

Procedure 4: The student will repeat the second and third procedure but with mirrors and using other angles of perspective.

Rank ordered criteria: Activity selected to develop understanding and provide experience toward:

Perception, basic (this is a cube, a triangle etc.)
Equivalence (i.e., two right triangles can "take up the same space and this rectangle");
Correspondence (This side of a parallelogram "goes with this side of a pentagon)
Properties of simple Euclidean geometry
Relations of objects in three dimensions

Relations between "open" and "closed" volumes
Psychomotor relationship with perception
Symmetry
Asymmetry
Reversibility (mirror images)
Beginning of combinatorial logic
Mental Imagery in space

5. Measurement

Materials: tagboard, pencil, scissors, and objects (animate or inanimate)

Procedure 1: The child will select an object (book, hand, shoe, arm width, etc.) to use as a basic measurement unit and will measure various other objects such as room length, desk height, window sill depth, in this unit.

Procedure 2: Extended exercise: The student will compare their unit of measure with another unit of measure (standard or other) and develop a ratio...such as two shoe lengths equal one lower leg.

Rank ordered criteria: Activity selected to develop understanding and provide experience toward:

Perception, basic
Equivalence
Correspondence
Conservation of length
Placement and displacement of objects
Additive measurement
Ratio relations

6. Leaves (extension of the preoperational activity of groups)

Materials: Variety of leaves collected by individual with guidance.

Procedure 1: The individual will separate leaves into a one level dichotomous classification according to their own criteria of

characteristics (i.e., lobed leaves and non-lobed leaves, or leaves that look like hands and fingers and leaves that do not). Put leaves back in one group and the individual will repeat the same procedure according to another characteristic.

Procedure 2: The individual will separate leaves into a two level dichotomous classification according to their own criteria of characteristics.

Procedure 3: Continue building levels.

Rank ordered criteria: Activity selected to develop understanding and provide experience toward:

Perception,
Equivalence
Class inclusion
Correspondence
One to Many multiplication of classes
Variables
Coordination of variables
Relations of other senses: sight, tactile, smell, etc.

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